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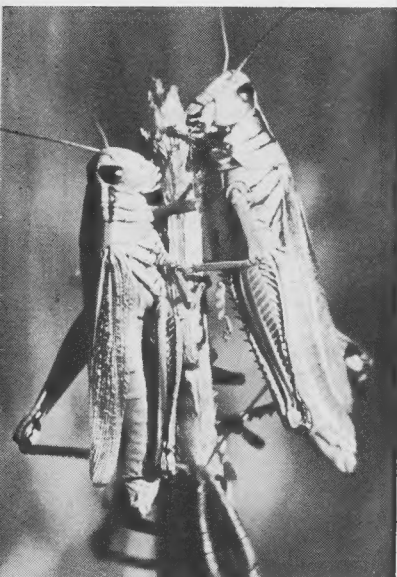
Control of

Grasshoppers

in the Prairie Provinces

by

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SCIENCE SERVICE · ENTOMOLOGY DIVISION
CANADA DEPARTMENT OF AGRICULTURE

MODERN METHODS MAKE GRASSHOPPER CONTROL EASY

Watch for Annual Forecasts

Help to organize a campaign if necessary.

Be prepared to play your individual part.

Make Grasshopper Control a Part of your Normal Farming Practice

By moldboard plowing of stubble fields infested with grasshopper eggs, where the practice does not increase the danger of soil drifting.

By starvation of newly hatched 'hoppers by early summer-fallowing.

Protect your Most Promising Crops

Fields properly summer-fallowed the previous year are free of grasshopper eggs; keep grasshoppers out of them.

Do not seed egg-infested stubble fields unless you are prepared to risk having added expense and trouble.

Handle stubble fields to be summer-fallowed in such a way as to keep grasshoppers from invading adjacent crops, by using starvation control, trap-and-guard strips, and poison.

Use Chemical Control

Look for and destroy roadside and other 'hoppers not affected by tillage.

Modern grasshopper poisons are cheap and effective.

GRASSHOPPER CONTROL PAYS, EVEN DURING DROUGHT AND HARD TIMES

CONTROL OF GRASSHOPPERS¹

in the Prairie Provinces

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HARMFUL AND OTHER GRASSHOPPERS

At least 90 species of grasshoppers have been found in the Prairie provinces of Canada. Of these, only about six damage field crops and gardens. The most common kinds are the migratory grasshopper², the clear-winged grasshopper³, and the two-striped grasshopper⁴. The Packard grasshopper⁵ is often found along with one or more of these on dry, light land, and the red-legged grasshopper⁶ in some more humid environments. *Melanoplus bruneri* Scudd. (no common name) is a close relative of the migratory grasshopper; it is often found in meadows of forested areas.

HOW GRASSHOPPERS GROW AND PASS THE WINTER

Grasshoppers hatch from eggs as nymphs. Newly hatched nymphs are about 1/8 inch long and are wingless but otherwise resemble the adults. As they grow, they shed their skins, usually five times; when grasshoppers are numerous, the empty skins may be plentiful in shallow hollows in the soil surface. Although the adults of some species have short, stubby wings or no wings at all, all of those named above have full-length wings.

The grasshoppers that attack crops in the Prairie Provinces overwinter in the egg stage in the soil and hatch in the spring or early summer. A few "range" species overwinter as partly grown grasshoppers. When these grasshoppers

¹Superseding Processed Publication Series, Entomology, Nos. 54, 73, 75, and 115.

²*Melanoplus mexicanus* (Sauss.).

³*Camnula pellucida* (Scudd.).

⁴*Melanoplus bivittatus* (Say).

⁵*Melanoplus packardii* Scudd.

⁶*Melanoplus femur-rubrum femur-rubrum* (Deg.).

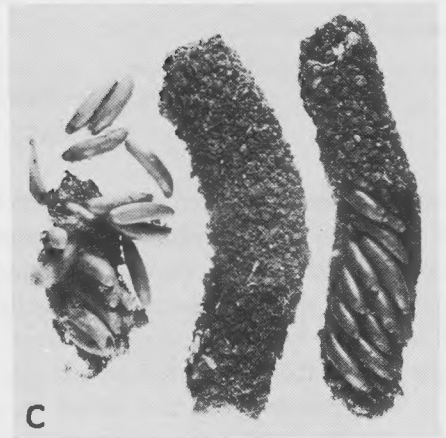


Figure 1. Eggs and egg pods of the migratory grasshopper (A), the clear-winged grasshopper (B), and the two-striped grasshopper (C). About three times natural size. The natural colors of individual eggs are respectively pale yellow, light brown, and olive to brown. (Photos by R.D. Bird and J.T. Robertson)



Figure 2. Side of a slice of sod heavily infested with eggs of the clear-winged grasshopper. About $1\frac{1}{2}$ times natural size. (Photo by R.D. Bird)



Figure 3. First-stage nymphs of the clear-winged grasshopper destroying seedling barley. About three times natural size. (Photo by R.D. Bird)

become active in the spring, they sometimes give rise to mistaken reports that harmful grasshoppers have begun to hatch. Like other grasshoppers that occur chiefly on the native prairie, they occasionally become numerous enough to damage range grasses, but they seldom invade crops.

GRASSHOPPER BREEDING GROUNDS

In the spring, injurious grasshoppers come from two main sources: (1) egg beds outside of but near cultivated fields; and (2) egg infestations scattered throughout stubble fields. The egg beds occur on roadside sod, on borders of sloughs, in pastures, and occasionally on ditch banks, drift ridges, and banks of irrigation canals. The clear-winged grasshopper is the most destructive roadside grasshopper, but the two-striped grasshopper may also invade and damage crops severely. Most of the eggs found in stubble fields are those of the migratory grasshopper, but it is not unusual to find eggs of the two-striped, Packard, and clear-winged grasshoppers along with them.

Recently, the migratory grasshopper has appeared as a serious pest in alfalfa fields and pastures in Manitoba and eastern Saskatchewan.

In weed-free summerfallow, eggs are too few to produce troublesome infestations of grasshoppers, even if the trash cover is heavy.

Grasshoppers that breed on the native prairie may become abundant on open range, but in the Prairie Provinces range land is rarely a breeding ground for grasshoppers harmful to field crops. Infestations may appear to come from range land if (1) young grasshoppers are first driven off stubble fields into range land by cultivation and later return to crops, or (2) egg beds of the clear-winged grasshopper happen to occur on native sod between crops and open range; such egg beds are associated with crop land and not with the range.

NATURAL CONTROL OF GRASSHOPPERS

Many natural controls tend to keep grasshopper numbers low. In cool wet weather, grasshoppers develop more slowly and lay fewer eggs. In warm damp weather, a fungus disease may kill many of the clear-winged and two-striped grasshoppers. Throughout the summer, birds, rodents, spiders, and predatory insects such as robber flies and solitary wasps take their toll of immature and mature grasshoppers. Red mites, although they rarely seem to kill their hosts, certainly weaken them and hamper their activities. The maggots of several species of flies often parasitize the lesser migratory and two-striped grasshoppers internally, reducing their numbers markedly. Many of the grasshopper eggs are destroyed by bee-fly maggots, blister-beetle grubs, ground-beetle grubs, birds, and rodents.

When these factors all work together, grasshoppers are rapidly reduced in number and the population may remain small for years. If some of these controls, particularly weather, cease to operate for a few months, grasshoppers immediately begin to increase and may become very abundant.

When grasshoppers are no longer held in check by nature it is necessary to

resort to artificial control, of which there are several methods.

THE GRASSHOPPER FORECAST

Watch the annual grasshopper forecast for information about: (1) the source of the expected infestations, i.e., whether stubble fields or egg beds along-side fields, or both, and (2) the expected severity of the outbreak. In widespread outbreaks, a preliminary forecast may be published in the press in the fall. This forecast indicates those districts in which there are so many eggs in stubble that fall tillage should be considered as a control measure. The final forecast is published in the press and on the familiar colored poster in mid-winter. It is the farmers' guide to individual and collective planning for grasshopper control.

MANAGEMENT PRACTICES DURING OUTBREAKS

Protect the Most Promising Crops

Stubble fields are poor risks for cropping during years of combined drought and grasshopper outbreak. In districts known to have dangerous numbers of grasshopper eggs in stubble fields, it is better to seed only fields that were summer-fallowed the year before; such fields have some moisture reserve and are free of grasshopper eggs. There is no known method by which stubble fields containing "moderate", "severe", or "very severe" egg infestations can be made completely safe for crop production. Do not crop such fields unless you are prepared to spend extra time and money to control grasshoppers in them. Experience has shown that it is frequently best to summer-fallow them.

Summer-fallow to Control Stubble Grasshoppers

On land to be summer-fallowed, reduce the number of grasshoppers by surface tillage in the fall, if this is practical in your district. Spring tillage that destroys all weed and volunteer growth just before or soon after the grasshoppers begin to hatch is very effective. Most newly hatched grasshoppers starve to death before finding their way out of a field with no green food. Early tillage is consistent with good summer-fallowing practice for controlling weeds and conserving moisture; you should be able to starve the grasshoppers with little or no extra effort and expense.

If partially grown grasshoppers are present at the time of a tillage operation, leave trap strips on which grasshoppers may concentrate for more economical poisoning. Poison the trap strips promptly, and work them as soon as they have served their purpose. If you prefer not to use trap strips, be prepared, before damage is done, to poison grasshoppers that are driven into crops. Do not force grasshoppers to move into your neighbors' crops.

Effectiveness of Tillage Implements—For control by starvation, practically all weeds and volunteer growth must be destroyed. Of the surface tilling implements, the one-way disk, properly adjusted, is the most effective for this purpose. Diskharrows, including the modern disker, and duck-foot cultivators are a little

less effective. Blade cultivators are least effective. Effectiveness of all implements varies from time to time and from place to place.

If you must sow a crop in egg-infested stubble, and if plowing is acceptable in your district, plow five inches deep with a moldboard plow. Turn the furrows well, and use a packer.

Depth and Speed of Operation of Tillage Implements—For grasshopper control, set surface-tilling implements to operate at depths not greater than necessary to produce a clean job of tillage. Run them as slowly as necessary for good soil conservation practices.

CHEMICAL CONTROL

Controlling grasshoppers with poisons is effective, convenient, and inexpensive. If you see the grasshoppers in time, you can nearly always protect your crops from them with poisons. Seeing the danger in time is important. If you are in a "forecast" area, watch for hatching; this may start as early as the first week in May during an early spring, but does not usually start until some time between May 20 and June 10. Examine the following regularly: egg-infested sod along margins of fields and in pastures adjoining fields; crops sown on stubble-fields; and margins of crops next to fields being summer-fallowed. Apply poisons as soon as dangerous infestations appear. Remember that a newly hatched grasshopper is only about one-eighth inch long.

Aldrin, chlordane, dieldrin, heptachlor, and toxaphene applied in sprays or dusts are very effective poisons. You can kill both young and mature grasshoppers with them, but the job is easier and cheaper when the grasshoppers are young, for then they infest comparatively small acreages. In sprays and dusts, there are both contact and stomach poisons. Therefore, if possible, apply them both to the grasshoppers and to their food plants. You may use them under a wide range of conditions, in short range grasses or in tall rank crops.

For general use, poisons in sprays and dusts are effective at the rates recommended on the container labels (see table of recommended rates of application on inside of back cover). However, where controlling large numbers of grasshoppers on small areas will protect large acreages, double or triple the rates for more rapid killing and for longer residual effect.

Aircraft are convenient for spraying large, widely infested areas, especially rough range land, or tall crops in which the use of ordinary field sprayers is not desirable.

Freshly applied sprays remain effective after showers and through short periods of rainy weather, if the sprays dry before rain begins.

During fine weather, immense numbers of grasshoppers may hatch from an egg bed each morning for several days, and move into nearby crops quickly. Be prepared to poison these at intervals of a few days. Do not expect one spray treatment applied at a standard rate to give adequate protection for more than three or four days.

Poisoned Baits

Poisoned baits are effective for the control of grasshoppers in very short, or very sparse and open, vegetation. They do not work well in tall, rank vegetation. You may find them useful in gardens or pastures where the residues of poisons in sprays and dusts are not desired. You may spread them by hand on a small scale, or on a large scale with home-made mechanical spreaders.

Baits are more effective when stored for at least 24 hours. Spread them on the mornings of days that promise to be clear and warm, and spread thinly at about 20 pounds of wet bait per acre.

You may prepare bait with bran, water, and a poison such as aldrin or chlordane emulsible concentrate. For each 100 pounds of bran, stir one 8-ounce cupful of poison concentrate into 10 gallons of water. Add the liquid to the bran, mixing thoroughly as you add, until the bran is thoroughly moistened.

Equipment

Dusters and low-pressure, low-volume sprayers as used for applying herbicides may be used without modification for applying grasshopper poisons in dusts and emulsion sprays. Blower-sprayers, or sprayers fitted with various arrangements of side-delivery nozzles, are convenient for treating roadsides, fence rows, or other hard-to-reach places.

Precautions

Use of Sprays or Dusts on Bee Pastures and on Forage Crops—To control grasshoppers in crops used for bee pasture, use toxaphene if the application has to be made after the crop is in bloom. Do not allow livestock to feed on insecticide-treated plants until danger from poison residues is past. The intervals required between treating the plants and pasturing or cutting them for feed are as follows: aldrin, 15 days; heptachlor, 5 days; chlordane, dieldrin, and toxaphene, 1 month.

Protect the Operator—If you apply and handle insecticides, protect yourself by observing the following precautions:

1. Avoid inhaling insecticide dusts, spray mists, or vapors. Wear a respirator, particularly when handling dusts.
2. Avoid spilling insecticide on the skin; avoid being sprayed or dusted with it. Wear coveralls and rubber gloves. Wash immediately with plenty of soap and warm water if the insecticide comes in contact with the skin in any way. If your clothing is contaminated, remove it immediately and wash it thoroughly before wearing it again.
3. After handling insecticides, wash your hands and face thoroughly before eating.
4. Do not smoke, and especially do not roll cigarettes, when handling insecticides.
5. Dispose of all mixed bait by spreading it thinly; do not leave it standing within reach of children or livestock.

6. At the first symptom of insecticide poisoning, usually headache or nausea, call a doctor immediately, giving him the name of the antidote listed on the insecticide container.

PROTECTING COVER CROPS AND FALL-SOWN GRAINS FROM GRASSHOPPER DAMAGE

For information on protecting these crops, see Canada Department of Agriculture Processed Publication Series, Entomology No. 126.

FURTHER INFORMATION

Forecast maps, instructions for making mechanical bait spreaders, and other information may be obtained from the following:

Entomology Section, Canada Department of Agriculture Research Laboratory, Box 322, University of Manitoba, Winnipeg 9, Manitoba;

Entomology Section, Canada Department of Agriculture Research Laboratory, University Sub Post Office, Saskatoon, Sask.;

Crop Insect Section, Science Service Laboratory, P.O. Box 270, Lethbridge, Alberta;

Entomology Laboratory, Canada Department of Agriculture, P.O. Box 210, Kamloops, B.C.;

Provincial Department of Agriculture at Winnipeg, Regina, or Edmonton; or your local agricultural representative or district agriculturist; and

Crop Insect Unit, Entomology Division, Department of Agriculture, Ottawa, Canada.

RECOMMENDED RATES OF APPLICATION OF GRASSHOPPER POISONS

Poison	SPRAYS			DUSTS		
	Amount of active ingredient per acre	Acres per gallon of concentrate *	Pounds of active ingredient per gallon of concentrate	Amount of active ingredient per acre	Pounds of prepared dust per acre *	Strength %
Aldrin	3 oz.	13	2½	6 oz.	15	2½
Chlordane	½ lb.	20	10	1 lb.	10	10
Dieldrin	1 oz.	24	1½	2 oz.	8	1½
Heptachlor	3 oz.	13	2½	3 oz.	7½	2½
Toxaphene	1 lb.	10	10	2 lb.	10	20

*Acres per gallon of spray concentrate, and rates per acre for dusts, are for preparations sold at the strengths listed. When using preparations of other strengths, adjust the rates accordingly.

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